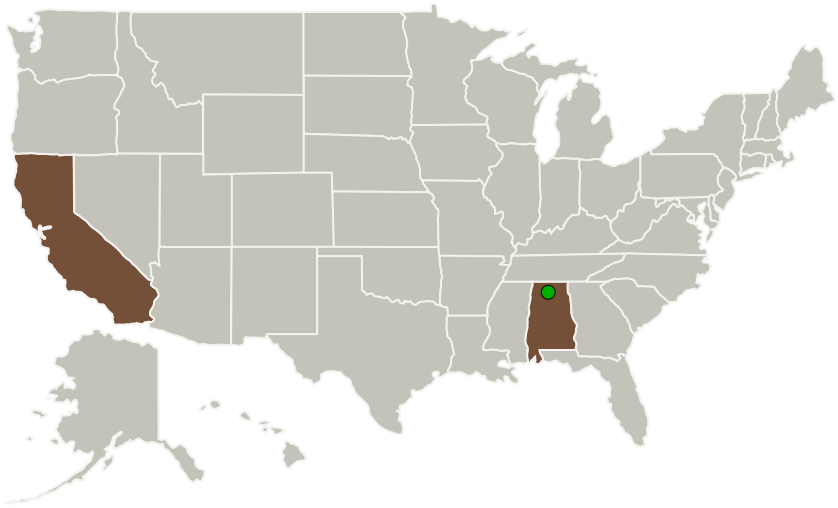
Development of Engine Loads Methodology, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

This SBIR seeks to improve the definition of design loads for rocket engine components such that higher performing, lighter weight engines can be developed more quickly. The long-term goal of this SBIR program is to substantially improve the overall load determination by demonstrating and validating new methods. The overall plan includes advances in computational fluid mechanics to provide more accurate tools for estimating the nozzle side loads and fluctuating pressure loads as well as the interaction between system models and components models and the combination of dynamic loads for prediction of component margins and life. The Phase I detailed development includes a tightly-integrated coupling of computational fluid dynamics and structural dynamics codes to better predict the nozzle side loads due to flow separation. In addition, improvements will be identified to both the loads process and the combination of dynamic loads in the time domain to support finite fatigue life predictions. These improvements to the loads definition will provide an improvement to the engine development process by providing better loads estimations which can be used to reduce conservatism and to significantly improve performance with reduced weight, cost, and development time. Phase II will include efforts to validate the fluid-structure interaction tool with experimental data and further develop and validate the new loads process methodologies.

Primary U.S. Work Locations and Key Partners



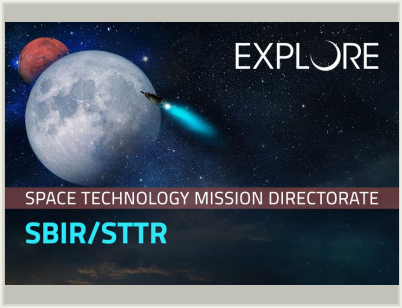


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
ATA Engineering, Inc.	Lead Organization	Industry	San Diego, California
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	California

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138096)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ATA Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

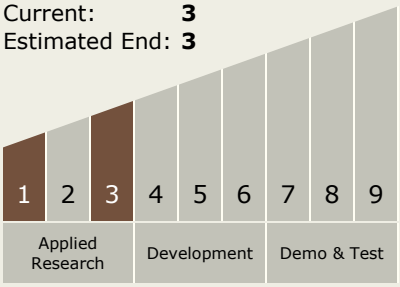
Carlos Torrez

Principal Investigator:

Eric Blades

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System